

REMARKS

Claims 1-29 are pending in this Office Action. Claims 1-29 were rejected in the Office action. Claim 1-29 are pending.

Claim Rejections under § 101

The Office action states:

13. Claims 18-23 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter since the claims as a whole are drawn to program per se and do not provide for a practical application, as evidenced by lack of physical transformation or a useful, tangible, and concrete result.

Applicants respectfully disagree. Independent claim 18 is directed to “a computer program **stored in a tangible medium** for optimizing a number, placement and size of fractures in a subterranean formation, **comprising executable instructions that cause at least one processor to.**” The Patent Office has recognized *Beauregard* claims as being directed to statutory articles of manufacture. MPEP 2106.01, I states that:

Computer programs are often recited as part of a claim. USPTO personnel should determine whether the computer program is being claimed as part of an otherwise statutory manufacture or machine. In such a case, the claim remains statutory irrespective of the fact that a computer program is included in the claim. The same result occurs when a computer program is used in a computerized process where the computer executes the instructions set forth in the computer program. Only when the claimed invention taken as a whole is directed to a mere program listing, i.e., to only its description or expression, is it descriptive material per se and hence nonstatutory.

In this case Applicants claim an article (the tangible medium), which includes instructions for execution by another physical object, in this case at least one processor. The claim is therefore not directed solely at the program *per se*, but rather to the article of manufacture that includes the computer program.

Claim Rejections under § 112, ¶ 1

The Office action states:

Claims 1-29 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

For example, claims 1, 18, and 24 recite:

determining one or more geomechanical stresses induced by each fracture based on the dimension and location of each fracture;

According to the above limitation, the stress is determined based on each fracture. In this case, the numbers of fractures are already known because the stress is determined by each fracture.

Then step two of the claim 1 recites,

determining a geomechanical maximum number of fractures based on the geomechanical stresses induced each of the fractures;

This limitation indicated to determine the maximum number of fractures which is already known from the first step wherein the stress is determined by each fracture. Therefore, this step is redundant. Whether it is called maximum or minimum, it is determining which is already determined in previous step.

Then, step three of the claims recites, determining a predicted stress field based on the geomechanical stresses induced by each fracture;

Well, the above recited limitation is just determining which already predicted stress. Therefore, to determine a stress that is already predicted stress could fail to comply with the enablement requirement. Further, the specification does not describe or define how the determination of a predicted stress was done. Does this mean determining a total stress based on the stresses induced by each fracture?

Applicants disagree. The legal inquiry under § 112, 1 is whether the specification as filed allows a person of ordinary skill in the art to practice the claimed invention without undue experimentation. There is no doubt that the specification provides sufficient support for each

claim limitation of claim 1. See, for example, paragraphs [0033]-[0054] and associated figures discussing various embodiments of determining stresses caused by fractures in a formation. The Office action has not pointed out any deficiency in enablement by applicant. Instead, the rejections are questions about the details of Applicants implementation of the claimed invention. Those details are found in the specification.

The Office action assumes that because the first element of claim 1 requires "determining one or more geomechanical stresses induced by *each* fracture based on the dimensions and location of each fracture," that the geotechnical maximum number of fractures is already known. That is incorrect. For example, the specification at paragraph [0038] discusses a situation where a next modeled fracture will fail. In that example embodiment provided in the specification at paragraph [0036], the geological maximum number of fractures will be less than the number of fractures modeled, because a fractured failed.

Similarly, step (c) of claim 1 is a separate limitation from elements (a) and (b). Example embodiment of the specification show that the stress field from a geomechanical number of fractures is different than the geomechanical stresses caused by each fractures. See, for example, paragraph [0036] and associated figures, paragraph [0037] and associated figures.

Even assuming for the sake of argument that the geomechanical maximum number of fractures was already known the claim is still enabled. Applicants claimed methods and computer program are not limited to any particular order of steps or elements.

The Office action further states:

Further, claims 1, 18, and 24 recite:

generating an optimized number, placement and size for
one or more fractures....;

It would have been obvious to one of ordinary skill in the art that the "generating number of fractures" could be derived from step (a) or step (b) because at least it indicated that the determination of number of fractures.

Therefore, it is possible to generate the number of fracture. However, it fails to comply with enablement requirement for "generating placement for one or more fractures" and "generating

of size for one or more fracture". It is proper to raise the question from where these two elements come from. Does this mean if the number of fracture known, then it is inherent to "generating placement and size for one or more fractures"?

Applicants disagree. Again, this rejection does not present a prima facie enablement challenge to Applicants' claims. As with the example above, element (d) requires the generation of "an optimized number, placement and size for one or more fractures." As an initial matter, no previous limitation required the determination of a placement or size for any fracture. Furthermore, this limitation is not directed to the geomechanical maximum number of fracture, but rather to the optimized number of fractures. The specification provides examples where the optimized number of fractures is not the same as the geomechanical number of fractures. See, for example, paragraphs [0032]-[0033] and associated figures.

The Office action assumes that because the first element of claim 1 requires "determining one or more geomechanical stresses induced by *each* fracture based on the dimensions and location of each fracture," that the geotechnical maximum number of fractures is already know. That is incorrect. For example, the specification at paragraph [0038] discusses a situation where a next modeled fracture will fail. In that example embodiment provided in the specification at paragraph [0036], the geological maximum number of fractures will be less than the number of fractures modeled, because a fractured failed.

Therefore, as per claim 1, it fails to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention at least for the above reasons. If step (a) is valid then step (b) would be invalid because the determination of number of fracture of step (b) is already determined by induced stresses by each fracture and therefore number of fracture is already determined (i.e. step (b) is invalid). Or if step (b) is valid then step (a) would be invalid because the determination of number of fracture is based on stresses induced by each fracture and therefore stress is already determined (i.e. step (a) is invalid).

Applicants disagree. This is an improper enablement inquiry. Claim elements do not invalidate each other. The Office action has made no showing that Applicants' specification is lacking sufficient detail to allow a person of ordinary skill in the art to practice the claimed invention.

Claim Rejections under § 112, ¶ 2

The Office action states:

17. Claims 1-29 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

c. As per claims 1, 18, and 24, for example, in step (a) indicates determining stresses induced by each fractures. This means, the number of fractures is already determined and therefore to determine the number of fractures based on stress of step (b) that is already determined in step (a) is redundant. Therefore, it is vague and indefinite.

d. At step (d), it is obvious to generate a number of fractures because at step (b), it is clearly described or defined the determination of number of fracture. However, it is unclear how "placement" and "size" of the fracture generated. Does this mean if the number of fractures are determined and generated, then the "placement" and "size" of the fractures are also generated? Therefore, step (d) is vague and indefinite. Further, it might miss a step to link the limitation of "generating placement and size for one or more fractures" with the rest steps of (a) to (c).

Applicants disagree. In rejecting a claim under the second paragraph of 35 USC 112, it is incumbent on the examiner to establish that one of ordinary skill in the pertinent art, when reading the claims in light of the supporting specification, would not have been able to ascertain with a reasonable degree of precision and particularity the particular area set out and circumscribed by the claims. *Ex parte* Wu, 10 USPQ2d 2031, 2033 (BPAI 1989). The Office action assumes that because the first element of claim 1 requires "determining one or more geomechanical stresses induced by *each* fracture based on the dimensions and location of each fracture," that the geotechnical maximum number of fractures is already know. That is incorrect. For example, the specification at paragraph [0038] discusses a situation where a next modeled fracture will fail. In that example embodiment provided in the specification at paragraph [0036], the geological maximum number of fractures will be less than the number of fractures modeled, because a fractured failed.

With respect to step (d), the Office action has not presented a prima facie case under 112, paragraph 2. The claim states that the placement and size of the fractures are generated. As

discussed above, this is enabled in the specification as filed. There is no requirement that claims themselves must enable the claimed invention, that is the job of the specification. Step (d) is a separate claim element from the other claim elements and it is neither vague nor indefinite. Other claim elements require a determination of the number of fractures, while (d) requires the generation of a size and location for fractures. As the specification describes, in certain implementations, this may take place in one process. That does not render the claim indefinite.

The Office action further states:

- e. Claims 16 recites "generally", which is a relative word and therefore vague and indefinite.

The fact that claim language includes relative terms does not automatically render the claim indefinite under Section 112, paragraph 2. *Seattle Box Co. v. Industrial Crating & Packing, Inc.*, 731 F.2d 818, 221 USPQ 568, 573-74 (Fed. Cir. 1994). Claim 19 requires that the subterranean formation have a generally vertical portion. A person of ordinary skill in the art, with Applicants' disclosure would understand the scope of this limitation. For example, the term "essentially vertical" was held to be definite in *Bailey v. Dunking Donuts, Inc.*, 45 USPQ 2d 1683 (Fed. Cir. 1998). In this case, Applicants' describe a vertical portion in both text and drawings. See, for example, paragraph 0004 and associated figure. A person of ordinary skill in the art with the benefit of Applicants' specification can ascertain the scope of this limitation.

The Office action further states:

- 18. Claims 1-29 are rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential structural cooperative relationships of elements, such omission amounting to a gap between the necessary structural connections. See MPEP § 2172.01. The omitted structural cooperative relationships are: generating placement and size for one or more fracture with the rest of the steps (a) to (c). There is a clear connection between generating number one or more fracture with steps (b) because a determination of number of fracture is made, but not for elements "placement" and 'size.

Applicants disagree. First, as stated above, Applicants are free to claim Applicants invention in this way. The determination of the geomechanical maximum number of fractures is separately claimed from a determination of the optimum number, placement, and size

of fractures. The specification provides example of this difference. Furthermore, the Office action does not even argue that the element is missing, rather that determining the placement and size is not claimed in the same element as determining the geomechanical maximum number of fractures. On its face, the Office action does not actually allege that the element is missing. Rather, the Office action is simply criticizing Applicants' claiming strategy under the guise of Section 112, paragraph 2, which is inappropriate. With respect to this rejection, the Office Action referred to MPEP section 2172.01, which states:

Unclaimed Essential Matter: A claim which omits matter disclosed to be essential to the invention as described in the specification or in other statements of record may be rejected under 35 U.S.C. 112, first paragraph, as not enabling. *In re Mayhew*, 527 F.2d 1229, 188 USPQ 356 (CCPA 1976). See also MPEP Section 2164.08(c). Such essential matter may include missing elements, steps or necessary structural cooperative relationships of elements **described by the applicant(s) as necessary to practice the invention**. In addition, a claim which fails to interrelate essential elements of the invention as defined by applicant(s) in the specification may be rejected under 35 U.S.C. 112, second paragraph, for failure to point out and distinctly claim the invention. *See In re Venezia*, 530 F.2d 956, 189 USPQ 149 (CCPA 1976); *In re Collier*, 397 F.2d 1003, 158 USPQ 266 (CCPA 1968). (emphasis added)

This section sets forth grounds for two distinct types of rejections: (1) a 112 first paragraph (enablement) rejection for claims that omit essential matter, and (2) a 112 second paragraph rejection for claims that fail to interrelate essential elements.

The Gentry Gallery Inc. v. The Berklene Cor. 45 USPQ2d 1498 (Fed. Cir. 1998) (hereinafter GENTRY), a relatively recent case, sets forth grounds for a third type of rejection that is related to those cited in MPEP 2172.01. Specifically, GENTRY held invalid under 112 first paragraph (written description) certain claims that did not recite the **location** of a claimed element, because the applicant had urged at numerous places outside the claims that the location of the element was essential to the invention.

None of these sources provide grounds for the rejection given in the present Office Action (i.e. a 112 second paragraph rejection for omitting essential elements). However, because the Office Action makes reference to "omitted essential elements", it shall be assumed

for the purpose of this response that the rejection of Claim 1 was meant to be based on 112 first paragraph (enablement).

It is the right and responsibility of the Applicant, not the Patent Office, to specify what the Applicant believes to be the metes and bounds of the invention. In general, the claims are the mechanism by which the Applicant communicates the metes and bounds of the invention to the Patent Office (and ultimately to the public).

...when the first paragraph speaks of “the invention”, it can only be referring to that invention which the applicant wishes to have protected by the patent grant, i.e. the *claimed* invention. For this reason the claims must be analyzed first in order to determine exactly what subject matter they encompass. **The subject matter there set out must be presumed, in the absence of evidence to the contrary, to be that “which the applicant regards as his invention.”** *In re Moore and Janoski*, 169 USPQ 236, 238, (CCPA 1971) (emphasis added)

However, in certain cases, some patent applicants have participated in the unwise practice of rigidly and emphatically stating, at locations other than in the claims, the metes and bounds of their invention. When such statements have been made outside the claims, the applicants have not been allowed claims that contradict the statements.

The “omitted essential element” ground of rejection, therefore, hinges on the existence of **statements made by the applicant that prove that what is recited in the claims is not the invention.** In *Mayhew*, this evidence involved statements made in the Specification that the functions of certain claimed elements **were only made possible** by the existence of another element that was omitted from the claims.¹

In *GENTRY*, this evidence involved statements in the Specification that **the only possible location** for a claimed element was at a particular location, where the claims failed to recite that the claimed element was at that particular location.²

¹ “Although appellant now strenuously argues that the cooling bath is optional, his specification not only fails to support this contention, but leads us, as it did the examiner and board, to believe that both it and its location are essential.” *Mayhew* at 358.

² “In this case, the original disclosure clearly identifies the console as the only possible location for the controls.” *GENTRY* at 1503.

Thus, the “omitted essential element” ground of rejection is similar to estoppel in that it prevents an applicant from making assertions that contradict previously-made statements. In particular, it prevents an applicant from asserting, implicitly through the claims, that the invention has one set of metes and bounds, when the applicant has already clearly stated elsewhere that the invention necessarily has a different set of metes and bounds.

It is respectfully submitted that the present rejection of claims 1-20 constitutes an erroneous application of the “omitted essential element” law. Specifically, the present applicant has not made any statements whatsoever to indicate that the invention recited in claims 1-20 is not what the applicant considers to be the invention. Nor has the applicant stated that the elements recited in claims 1-20 would be impossible to implement in the absence of elements that are not recited in claims 1-20 . Rather, it is entirely possible to implement the elements recited in claims 1-20 without also implementing a video pump, communication channel, etc.

Further, the Office Action fails to identify any statement in the Specification, or made by the Applicant elsewhere, that even remotely implies that the invention recited in claims 1-20 could not be practiced in the absence of unclaimed elements. Therefore, any attempt to force such unclaimed elements into claims 1-20 would unduly narrow the claim.

For the reasons given above, it is respectfully submitted that claims 1-20 are not missing any elements that are essential to practicing the invention that is recited in claims 1-20 . Further, the metes and bounds of the invention set forth in claims 1-20 do not contradict any statements about the invention elsewhere. Rather, Applicant goes to great effort to refrain from making any statements about the invention (as opposed to embodiments thereof) outside the claims themselves, since at best such statements are innocuously redundant with the claims, and at worst they are confusingly contradictory with the claims. Removal of the rejection to claims 1-20 is therefore requested.

Claim Rejection under § 102

The Office action states:

20. Claims 1-7, 16-22, and 24-28 are rejected under 35 U.S.C. 102(b) as being anticipated by M.Y. Soliman, J. L. Hunt, and A. M. El Rabaa, "Fracturing Aspects of Horizontal wells", 1990 Society of Petroleum Engineers.

f. As per Claim 1, Soliman discloses a method of optimizing a number, placement and size of fractures in a subterranean formation (See: "Summary" in page 966) comprising the steps of:

a. determining one or more geomechanical stresses induced by each fracture based on the dimensions and location of each fracture (See: page 967, "Determining Magnitude and Orientation of Least Principal Stress" and also Figs. 1 and 2);

b. determining a geomechanical maximum number of fractures based on the geomechanical stresses induced by each of the fractures (such as...reaching five fractures after a month(i.e. five fractures are maximum number of fractures) but declined to only two fractures after 24 month...;See: page 969, middle column, lines 9-13);

c. determining a predicted stress field based on the geomechanical stresses induced by each fracture (See: page 967, "Determining Magnitude and Orientation of Least Principal Stress"); and

d. generating an optimized number, placement and size for one or more fractures in subterranean formation (See: Figs. 15, 16, 17, table 2 and corresponding texts), where generating the optimized number, placement and size for one or more fractures in a subterranean formation is based, at least in part, one or more of:

the geomechanical maximum number of fractures (such as...reaching five fractures after a month (i.e. five fractures are maximum number of fractures) but declined to only two fractures after 24 month...; See: page 969, middle column, lines 9-13); and the predicted stress field based on the geomechanical stresses induced by each fracture (See: page 967, "Determining Magnitude and Orientation of Least Principal Stress").

Claim 1 requires, in part, "generating an optimized number, placement and size for one or more fractures in a subterranean formation, where generating the optimized number, placement

and size for one or more fractures in a subterranean formation is based, at least in part, on one or more of: the geomechanical maximum number of fractures; and the predicted stress field based on the geomechanical stresses induced by each fracture.” Even assuming for the sake of argument that Soliman at 969 discloses determining a optimized number of fractures, which Applicants do not concede, there is no disclosure of further determining the placement and size of each of these fractures. Soliman simply does not disclose this limitation. Nor is this limitation inherent in the disclosure of Soliman.

Furthermore, Applicants simply disagree that Soliman discloses a determination of the optimized number, based, at least in part, on one or more of: the geomechanical maximum number of fractures; and the predicted stress field based on the geomechanical stresses induced by each fracture. Soliman’s discussion of “optimum number of fractures” is based on declining flow rates over time. Soliman states that “the optimum number of fractures depends on formation and fluid properties.” “Formation and fluid properties” are not a disclosure of either (1) the geomechanical maximum number of fractures or (2) the predicted stress field based on the geomechanical stresses induced by each fracture. As such, Soliman does not anticipate each limitation of claim 1.

Claim 1 further requires, in part, “determining a geomechanical maximum number of fractures based on the geomechanical stresses induced by each of the fractures.” This limitation is not disclosed in Soliman. The Office action cites a portion of Soliman that states “[t]he number of fractures at which the maximum flow rate occurs declines with time, reaching five fractures after 1 month but declining to only two fractures after 24 months.” Soliman, at 969. Soliman’s discussion of “number of fractures at which the maximum flow rate occurs” is not a disclosure of “a geomechanical maximum number of fractures.” For example, a given formation may be able to support a large number of fractures geomechanically, but the number of fractures required for maximum flow rate may be much less. Furthermore, Soliman’s determination of “[t]he number of fractures at which the maximum flow rate occurs” is not based on “stresses induced by each of the fractures,” as required by the claim. For at least these reasons Soliman fails to disclose the limitations of claim 1.

Independent claims 18 and 24 include similar limitations, which are similarly not disclosed by Soliman. Each of the remaining claims depends from one of claims 1, 18, or 24 and are therefore patentable over the cited references.

In the Response to Arguments section, the Office action further states:

7. Applicant's argument relating to art rejection is not persuasive and therefore the rejection is maintained.

a. Applicants argue, applicants simply disagrees that Soliman et al discloses determination of the optimized number, based, at least in part, on one or more of: the geomechanical maximum number of fractures; and the predicted stress field based on the geomechanical stresses induced by each fracture (See: Remarks, page 13).

In response, Soliman et al teaches:

...determining the optimum number of fractures intercepting a horizontal well, and the mechanism of fluid into fractures horizontal well... (See: Summary, page 966)...

...to determine the optimum number of fractures...(See: page 968, right side column last paragraph)...

...Fig. 12 is a schematic representing one simulator run for the case of two fractures (i.e. number of fractures)...; (See: page 969, left side column)...

Applicants disagree. In each of these cases the Office action ignore the claim requirement that the optimum number of fractures is based on “at least in part, on one or more of: the geomechanical maximum number of fractures; and the predicted stress field based on the geomechanical stresses induced by each fracture” as required by the claims. None of these cited sections disclose that limitation. The only similarity is that both the Soliman reference and this claim refer to an optimized number of fractures. As Applicants have shown, however, the two solutions use different methods to arrive at an optimum number of fractures. In particular, the claims require that the optimum number, place, and size of the fractures is determined based “based on “at least in part, on one or more of: the geomechanical maximum number of fractures; and the predicted stress field based on the geomechanical stresses induced by each fracture” as required by the claims. The Soliman reference does not disclose this.

Figure 12 does not disclose the determination of the number of fractures as required by the claims. Instead, the simulator run resulting shown in Figure 12 is “for the case of two fracture.” There is no direct or inherent disclosure of the determination of the number of fractures for that simulation based on “at least in part, on one or more of: the geomechanical

maximum number of fractures; and the predicted stress field based on the geomechanical stresses induced by each fracture” as required by the claims.

b. Applicants argue, there is no disclosure of further determining the placement and size of each of these fractures. Soliman simply does not disclose this limitation (See: Remarks page 13).

In response, Soliman et al discloses the limitation of determining the placement and size of each of fracture in the following portion of the reference. For example, Soliman et al discloses:

...the paper discusses the fracture orientation with respect to a horizontal well-bore, locating a horizontal well to optimize fracture height (i.e. determining size of one or more fracture), determining the optimum number of fractures intercepting a horizontal well...(See: Abstract)...

... to optimize the placement of horizontal section of a well. The horizontal placement is designed to give optimum fracture height...(i.e. placement and size of fracture)...(See: page 970, middle Column)...

...stress varying through the pay zone, optimum placement of the horizontal wellbore can be determined (i.e. determining placement of one or more fractures)... (See: page 971, middle Column last paragraph)....

Applicants disagree. These statement from the Soliman references statement discusses the placement of a **wellbore**, not the placement and size of **fractures**, as required by the claim. The placement of the horizontal section of a wellbore does not directly or inherently disclose the placement and size of fractures as required by the claim.

The Office action further states:

Further, Figure 2 clearly shows the generation of number of fractures, placement of fractures, and size of fractures based on stresses as seen below:

Applicants disagree. Figure 2 is an illustration of fractures in a formation. Figure 2 makes no disclosure of the generation of a number, placement, or size of fractures based on the geomechanical stresses of each fracture. The Soliman reference simply states that “Figs. 1 and 2 show fracture direction vs. well direction.” Figure 2 does not directly or inherently disclosure of “number, placement and size for one or more fractures in a subterranean formation, where

generating the optimized number, placement and size for one or more fractures in a subterranean formation is based, at least in part, on one or more of: the geomechanical maximum number of fractures; and the predicted stress field based on the geomechanical stresses induced by each fracture” as required by the claims. The figure shows the in situ stress in the formation. The in situ stress in the formation is not the same as the “predicted stress field based on the geomechanical stresses induced by each fracture.” Furthermore, neither the figure nor any text in the Soliman reference directly or inherently discloses that the generation of number, size, and location of fractures based on the stress field generated by the fractures.

Double Patenting

The Office action states:

11. Claims 1 and 24 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1, 29, 34, and 39 of U.S. Patent No. 7, 104, 320. Although the conflicting claims are not identical, they are not patentably distinct from each other because claim 1, 29, 34, and 39 of Patent No. 7, 104, 320 contains every elements of claims 1 and 24 of the instant application and thus obvious over the claims of the instant application. The only difference between the claims is drilling vertical and horizontal wellbore, which is recited in the patent claims. In order to determine the number of fractures, there must have some kind of drilling whether it is horizontal or vertical. Therefore, it would have obvious to one of ordinary skill in the art to include the horizontal and vertical drilling to the later application for determination of number of fractures. Claims of the instant application therefore are not patently distinct from the earlier patent claims and as such are unpatentable over obvious-type double patenting. A later application claims are not patentably distinct from an earlier claims if the later claims are obvious by the earlier claims.

A terminal disclaimer is submitted with this response to overcome this rejection.

SUMMARY

Applicants contend that the claims are in condition for allowance, which action is requested. Should any additional fees be required, Applicants request that the fees be debited from deposit account number 02-0383.

Respectfully submitted,

/Bradley S. Bowling/

Bradley S. Bowling

Reg. No. 52,641

ATTORNEY FOR APPLICANTS

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